ORIGINAL ARTICLE

Evaluation of CPITN and BMI Indices in Patients with Uncontrolled Type 2 Diabetes

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Abstract

Objective: Diabetes mellitus has multiple effects on oral tissues. Oral symptoms especially periodontal disease and recurrent bacterial and fungal infections seem to vary in patients with different body mass index. The aim of this study was to investigate periodontal treatment needs Index in patients with uncontrolled type 2 diabetes and its relation with body mass index (BMI).

Materials and Methods: In this cross-sectional analytical study, 150 individuals with uncontrolled type 2 diabetes referred to Yazd Diabetes Research Center in 2016 were studied in terms of BMI and the Community Periodontal Index of Treatment Needs (CPITN). Patients divided in two groups: BMI of over 30 and under 30. Data obtained from each group analyzed using SPSS software version 16 and Mann-Whitney statistical test was used.

Results: The mean of CPITN index was not significantly different in men and women. Also in different age groups, there were no significant differences, except 50 to 59 years range. In this age group, the mean of CPITN in patients with BMI above 30 was 1.926 and in BMI under 30 was 1.5792 (*P*-value:0.019). In patients with BMI above 30 the mean of CPITN reported 1.88 in comparison with 1.61 in group with BMI under 30 (*P*-value:0.030).

Conclusion: The results indicated that diabetic patients with a BMI greater than 30 need more periodontal treatment than patient with BMI less than 30. Also indexes in the age range 50 to 59 years was more prominent which means clinicians have to consider patients with uncontrolled type2 diabetes more carefully for providing oral health when BMI and age are increasing.

Keywords: Diabetes, Periodontitis, Body mass index, Community periodontal index of treatment needs

Introduction

Diabetes mellitus is the most common endocrine and metabolic diseases. It is determined by an abnormal increase in blood glucose levels and impaired metabolism of carbohydrates, protein and lipid (1). This disease is accompanied by long-term disorders such as retinopathy, nephropathy, neuropathy, cardiovascular disorders and oral symptoms. The prevalence of diabetes in Iran in 2000 was 7.5% of the population, and by 2025 it will raise to 8.6% that will be equivalent to 1.5 million patient (2-4).

The most important oral symptoms associated with diabetes include dry mouth, burning

mouth, taste changes, candidiasis, increasing the amount of decay and progressive periodontitis. Periodontitis is known as the sixth complication of diabetes and the pathophysiology relationship between them was established. From one side, role of diabetes mellitus as a risk factor for the development of gingivitis and periodontitis is proven and depending on the level of glycemic control, diabetes mellitus increases the response to bacterial plaque by gingiva than non-diabetic patients. On the other hand periodontal disease and gingivitis cause weaker control of blood sugar. Also hyperglycemia increase amount of glucose in GCF and causes to change quality of bacteria and increases periodontal diseases in patients with uncontrolled diabetes. (1,5-9)

One of the main risk factors for diabetes mellitus is obesity (2). So far, many studies have investigated a possible link between obesity and periodontal disease. It is thought that hormones and cytokines derived from immune cells in fat tissue cause a series of inflammatory reactions that cause periodontal disease. However, the exact mechanism to determine the relationship between body mass index (BMI) and periodontal disease was not clarified. (10-12)

On the other hand many studies such as Bacic et al. revealed relation between diabetes and loose of teeth which indicates a hypotheses that diabetes can compromise oral health indexes. (13)

In contrast some studies like Rylander et al. with aim to evaluation of periodontal tissues health in diabetes patients and comparison with control group revealed that there were no significant differences between two groups. (14)

Several studies investigated the relationship between the frequency and severity of periodontal disease and obesity or increased BMI in some populations such as heart disease patients, postmenopausal women, people with diabetes and healthy subjects. (12,15-17)

This study designed to evaluate status of periodontal health index in two groups of uncontrolled type II diabetes regarding to BMI index.

Materials and Methods

This study was an analytical cross-sectional study. According to similar articles the total of 150 samples were used in this study. Patients with uncontrolled type 2 diabetes under treatment with oral hypoglycemic agents referred to Yazd Diabetes Research Center in 2016 which selected by simple random sampling method and divided into two groups. After approval of the project in university ethics committee sampling was done. This research was described initially for patients with written informed consent, and then patients were included in the study. To collect information of patients a checklist consisted of two parts was used, in the first section basic information (including age, sex, and duration of diabetes, the diabetes control level and latest result of HbA1c test) and the other section included BMI and CPITN indexes. BMI indexes were calculated and CPITN indexes were obtained by oral examination with probe and dental mirrors were recorded. Inclusion criteria of patients to the research were uncontrolled type II diabetes and level of latest HbA1c test above or equal to 8, lack of other systemic diseases and age range of 30-59 years old. Exclusion criteria were having less than 20 teeth, currently.

Patients were divided in to two groups based on BMI (BMI < 30, BMI ≥ 30). Patients' CPITN index was determined using the 5 codes: (Code 0 = healthy periodontal tissues, Code 1 = bleeding on probing, code 2 = dental calculus, Code 3 = pockets with a depth of less than or equal to 5mm and Code 4 = pocket depth with a depth of 6mm or more) and information was recorded. Sample size was determined according to similar articles considering significant level of 5% and test power of 80%. Data obtained from each group analyzed using SPSS version 16 and Mann-Whitney statistical test was used.

Results

One hundred and fifty samples were divided in two groups of 30≤BMI and 30> BMI. Group A (30≤BMI), including 42 women and 33 men in the age range of 59-30 and an average age of 45 and Group B (30> BMI) included of 23 females and 52 males in the age range of 59-30 and the average age of 40.

The mean of CPITN index in this study did not show significant differences between men and women. (Table 1)

Also for evaluation and comparing of periodontal health and BMI between two groups with 30≤BMI and 30>BMI, group with BMI above 30 and the average of 1.8863 and group with BMI under 30 and the average of 1.6189 revealed significant difference. (Table 2)

The evaluation of periodontal health indexes in different age groups of 30 to 39, 40 to 49 and 50 to 59 revealed that just in group of 50 to 59 years there are significant differences between two group with BMI above 30 and BMI under 30. (Table 3) (P-value=0.019)

Also two groups were compared in term of age, duration of diabetes, frequency of teeth brushing and HbA1C test as confounding variables which revealed no significant result for any one. (Table 4)

Discussion

The present study aimed to evaluate and comparison of periodontal status in two groups of patients with uncontrolled diabetes grouping by BMI index.

Prevalence of diabetes in Iran was 5.7% in 2000 and it is estimated to increase up to 6.8% in 2025 which means approximately about 5.1 million people. (3,4)

One of the main risk factors for diabetes

Table1. Comparing the mean and median CPITN in subjects according to sex

| Sex | CPITN | | | | *P*-Value |
	Median	Standard Deviation (SD)	Number	Mean	
Female	1.50	0.75	65	1.57	0.27
Male	1.50	0.93	85	1.64	
Total	1.50	0.85	150	1.61	

Mann-Whitney Test

Table 2. Comparing of CPITN in two studied groups based on BMI

| BMI | CPITN | | | | *P*-value |
	N	Mean	Median	SD	
BMI > 30	75	1.88	1.80	0.671	0.03
BMI < 30	75	1.61	1.60	0.746	

Mann-Whitney Test

Table 3. Comparing each group in age and CPITN

| Age | CPITN | | | | | | | | *P*-Value |
| | BMI > 30 | | | | BMI < 30 | | | | |
	Mean	Median	SD	N	Mean	Median	SD	N	
30-39	1.61	1.550	0.007	8	1.69	1.800	0.45	6	0.85
40-49	1.90	1.60	0.83	22	1.72	1.800	0.59	16	0.71
50-59	1.92	1.83	0.60	45	1.57	1.400	0.81	53	0.01

Mann-Whitney Test

Table 4. Comparing the mean of age, tooth brushing number, duration of diabetes and HbA1C in two groups

| Variable | BMI ≥30 | BMI< 30 | Total | *P*-value |
	Mean± SD	Mean ±SD	Mean± SD	
Age	50.52 ±7.202	51.73 ±7.282	51.13 ±7.245	0.222
How many toothbrushes a day	2.29 ±1.691	2.27 ±1.655	2.28 ±1.667	0.952
Duration of disease since diagnosis	9.53 ±6.550	8.68 ±5.994	9.11 ±6.271	0.466
HbA1c	9.439 ±1.248	9.433 ±1.495	9.436 ±1.372	0.437

Mann-Whitney Test

mellitus is obesity. By raise in body weight occurrence of type II diabetes increases significantly. On the other hand, occurrence of periodontal disease is significantly higher in diabetic patients comparing to non-diabetic patients. (2,18-20)

Distortion and changes in vascularity of gingiva, reduction of immunological response to pathogens in defensive cell lines of host and increase in salivary glucose are assumed as effective factors in occurrence of almost all periodontal diseases in diabetic patients. (15,21-23)

In the present study we aimed to examine the impact of factors such as weight gain on periodontal health in patients with diabetes that may address patients to reach improvements in their periodontal health status. The results of study showed that significant correlation exists between BMI and index of periodontal health in uncontrolled type 2 diabetes patients. In the group with BMI over 30, periodontal health index demonstrated the need to further periodontal treatment.

Many studies have examined the relationship between obesity and periodontal disease.(5,15,19-22,24-27). Most of these studies were performed in healthy subjects in terms of systemic health.(5,15,20-22,25-27)

These results are similar to results of the study of Lalit Kumar Mathur and colleagues which demonstrated that obesity is a risk factor for periodontal disease (20). Studies of Pataro Al et al (5), Andrea Garman et al, and yagob salekzamani et al (22) also confirm the results of the present study.

Vinaly Humar and colleagues in a study in 2013, aimed to evaluate the association between body mass index and periodontal status. it was demonstrated that increase in BMI is a risk factor for periodontitis (25).

In the study by Altamash M and colleagues in 2013, they evaluated the periodontal condition based on HbA1C, BMI and WC (waist circumference) in diabetic patients. Weight gain was observed among all the samples. Pocket depth greater than 6 mm observed in the sample that had poor glycemic control compared to others and people with poorly controlled diabetes showed severe conditions in periodontal disease (28).

The other study in 2014 aimed to evaluate the relationship between obesity and oral diseases. In that study, oral hygiene index were used which was 13.1 ± 16.2 among overweight patients and 13/1 ± 5/2 in normal individuals. It was concluded that there was no significant relationship between increased BMI and periodontal status and BMI only could be a predictor of increase in gingival bleeding (27).

In the study about body mass index and periodontitis in patients with type 2 diabetes in Arabs were investigated. 112 samples with 30≤BMI and 74 samples with BMI≤30 were collected. All samples were diabetic and assessed with HbA1C. The study revealed that there was no association between periodontitis and BMI in people with type 2 diabetes, and the authors stated that more studies are needed in this field (24). The study authors noted that the results of the study may be due to sample youth that camouflaged effects of obesity on periodontitis and also due to the index used for identifying periodontitis that pocket depth had been considered, but as we know in some cases presence of periodontitis is without development of pockets.

So far, many hypotheses about the relationship between obesity and periodontal disease have been reported. It is thought that hormones and cytokines derived from immune cells in fat tissue cause a series of inflammatory reactions that cause periodontal disease. However, the exact mechanism to determine the relationship of BMI with periodontal disease has not been revealed. Some probable theories about a possible link between obesity and periodontal disease are: adipose tissue-derived hormones and cytokines, imbalances in the immune system, reduced blood flow in periodontal tissues, hyperlipidemia, and mechanisms related to unhealthy lifestyle and emotional and mental stresses. (29-35)

The results of presented study also showed that only in the age group of 50 to 59 years,

with an increase in BMI, CPITN index also increased. The results are valuable due to its emphasis on the requirement of oral professional care in patients with higher BMI. On the other hand, results in younger patients were not comparable precisely due to the low number of samples, so it might be significant with further studies with higher number of patients.

Also two groups were compared in terms of age, duration of diabetes, frequency of teeth brushing and HbA1C test as confounding variables which revealed no significant result. This showed that there is a normal distribution in samples of the groups which causes higher

research integrity in evaluation of BMI and CPITN indexes.

Conclusions

The results indicate that obese diabetic patients need more periodontal treatment than patients with BMI less than 30. Also indexes and differences in the age range 50 to 59 years is more prominent which means clinicians have to consider patients with uncontrolled type2 diabetes more carefully for providing oral health when BMI and age are increasing.

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